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Personal Liberty Laws (Statutes of Mass.), and Slavery in the Territories (Case of Dred Scott). 8vo pamph. Boston. 1861.

Royal Institution of Great Britain.

Notices of the Proceedings at the Meetings of the Members. Vol. III. Part 10. Nov. 1859 – July, 1860. 8vo. London. 1860.

List of the Members, Officers, &c. for the Year 1859. 8vo. London. 1860.

Radcliffe Trustees.

Radcliffe Catalogue of 6317 Stars, chiefly Circumpolar, reduced to the Epoch 1845.0; formed from the Observations made at the Radcliffe Observatory, under the Superintendence of Manuel John Johnson, M. D., late Radcliffe Observer; — with Introduction by Rev. Robert Main, M. A., Radcliffe Observer. 1 vol. Roy. 8vo. Oxford. 1860.

Four hundred and ninety-seventh meeting.

August 14, 1861. — STATUTE MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read letters relative to the exchanges of the Academy; also letters from the Rev. Professor Peabody and Mr. Ferrel, in acknowledgment of the official notification that they had been chosen Fellows of the Academy, and from the family of the late Chief Justice Shaw, and from that of the late Judge White, in acknowledgment of the reception of copies of the resolves of the Academy adopted upon the occasion of the announcement of their decease.

A quorum for the transaction of business not being present, scientific communications only were received.

Dr. Beck gave an account of the principal manuscript copies of the *Satyricon* of Petronius Arbiter preserved in various European libraries, and which he had examined; and he presented to the Academy a collation of the various readings of these manuscripts, with a view to the construction of an amended text of this author.

The Corresponding Secretary communicated, from the author, the following paper: —

Musci Cubenses, or Mosses collected by Charles Wright in the Eastern Part of the Island of Cuba during the Years 1856, 1857, *and* 1858. By WILLIAM S. SULLIVANT.

Gen. SPHAGNUM, *Dill.*

1. S. CYMBIFOLIUM, *Ehr.; Sch. Nat. Hist. Sphaig. p.* 73, *t.* 19. — Wet places on the tops of high mountains. — Specimens without fruit: the cortical utricles of the branches often destitute of fibres.

Gen. POTTIA, *Ehr.*

2. P. TORTULA, *C. Mull. Synop. Musc.* 1, *p.* 559; *Schwægr. Suppl. t.* 175. — On rocks.

3. P. BARBULA, *C. Mull. l. c. p.* 558; *Schwægr. Suppl. l. c.* — On rocks along mountain rivulets. — Remains of a peristome resembling that of *Barbula* were found on some of the specimens.

Gen. WEISSIA, *Hedw.*

4. W. EDENTULA (*sp. nov.*): dioica, capsula oblonga gymnostoma exannulata, cæterum *W. crispatæ* simillima. — On the ground in shady thickets.

5. W. VIRIDULA, *Brid.; Bryol. Europ. t.* 21 & 22. — On banks by road-sides.

Gen. PHYSCOMITRIUM, *Brid.*

6. P. SPATHULATUM, *C. Mull. Synop. Musc.* 1, *p.* 118? — Wet places by road-sides in woods.

Gen. GYMNOSTOMUM, *Hedw.*

7. G. IMMERSUM, *Sulliv. Icones Muscorum, ined. t.* 56. — Moist places along shaded roads.

8. G. RUPESTRE, *Schwægr.*, var. statura majore, cæspite laxa, foliis lineari-lanceolatis acutis: forsan species propria. — On steep, shaded banks, along rivulets.

Gen. FUNARIA, *Schreb.*

9. F. HYGROMETRICA, *Hedw.; Bryol. Europ. t.* 305. — On the ground; common.

Gen. FISSIDENS, *Hedw.*

10. F. POLYPODIOIDES, *Hedw. Musc. frond.* 3, *p.* 63, *t.* 27. — On banks in dense woods.

11. F. MINUTULUS, *Sulliv. in Mem. Amer. Acad. n. ser.* 3, *p.* 58, *t.* 2; *Icones Musc. ined. t.* 24. — On calcareous banks in thickets.

12. F. MINUTULUS, var. foliis latioribus, capsula inclinata. — Same locality.

13. F. SIMILIRETIS (*sp. nov.*): dioicus exiguus simplex; caule rigido inferne nudo; foliis 20 – 30-jugis confertissimis subhomomallis linearibus acutis minute subopace guttulato-areolatis toto ambitu immarginatis minutissime crenulato-serrulatis, duplicatura ⅔ producta, lamina dorsali angusta ad basin vel supra desinente, costa valida pellucida flexuosa sub apice dissoluta; capsula terminali brevius pedicellata oblongo-obovata; operculo et calyptra desideratis. — On cliffs among mountains. — A larger species than the last: fronds 4 – 5 lines high and about one line wide, pale olive-green above and reddish-brown below: leaves not crisped when dry.

14. F. DISSITIFOLIUS (*sp. nov.*): dioicus simplex erectus mollis remoti-folius; foliis elongato-oblongis lineari-oblongisve breviter acutis fere ad apicem subdenticulatam anguste marginatis, lamina dorsali lata ad basin sensim vel abrupte desinente, e cellulis laxis amplis hexagono-rotundatis (illis duplicaturæ basilaribus oblongis amplioribus) areolatis, costa infra apicem evanescente; capsula terminali ovali-oblonga; operculo longirostrato; calyptra dimidiata. — Wet rocks in shaded ravines. — Somewhat larger than the last species, with distant, dark green, and when dry crisped leaves.

15. F. DENSIRETIS (*sp. nov.*): dioicus parvus gracilis simplex rigidus; foliis 20 – 25-jugis confertis subsecundis linearibus sensim acutatis minutissime crenulato-serrulatis opacis ad apicem usque pellucido-costatis, lamina duplicaturæ ½ producta limboque pellucido intromarginali instructa, lamina dorsali apicalique immarginatis; capsula terminali brevius pedicellata obovato-oblonga; operculo longirostrato; calyptra dimidiata. — On the bottom of dried-up rivulets. — Fronds slender, 5 – 8 lines high, gradually increasing in width from the base upwards, but nowhere more than about half a line wide: leaves dark green, opaque, with very minute cells, remarkable for the band composed of three rows of pellucid, linear cells, just within the margin of the duplicature.

16. F. CUSPIDULATUS (*sp. nov.*): dioicus pusillus simplex gracilis; foliis 16 – 20-jugis elongato-oblongis obtusiusculis costa pellucida excedente cuspidulatis opacis crenulato-serrulatis minutissime guttulato-areolatis, lamina duplicaturæ ⅔ – ¾ productæ hyalino-marginata, lamina apicali et dorsali ad basin late rotundata immarginatis; capsula termi-

nali oblonga; operculo et calyptra precedentis. — On rocks in ravines. — Fronds slender, 4 – 5 lines high, dark olive-green. Near *F. Ravenelii*, but a taller plant with more oblong leaves, their dorsal lamina broad and obtuse at the base.

17. F. RUFULUS (*sp. nov.*): synoicus perparvulus simplex; foliis 5 – 7-jugis lanceolato-linearibus sensim acutis rufulis integerrimis immarginatis, e cellulis majusculis hexagono-rotundatis pellucidis areolatis, duplicatura ½ producta apice inæquali, lamina dorsali latiuscula ad basin abrupte desinente, costa concolori percurrente; capsula breviter pedicellata ovali-oblonga; calyptra conica longum operculi rostrum solum tegente. — On reddish earth, attached to the roots of trees uptorn by wind. — A minute species, 1 – 2 lines high, of a pale brownish-red color: agrees in many respects with the description of a Surinam species, *F. pellucidus, Hornsch. in Linnæa,* 1841, *p.* 146, but the leaves are of a firm texture, and the areolation, though large, not splachnoid; furthermore, the inflorescence is synoicous, which is not asserted of the Surinam plant.

18. F. ANGUSTIFOLIUS (*sp. nov.*): dioicus pusillus conferte flabellatim foliosus; foliis linearibus angustissimis longissimis acutis circumcirca marginatis integerrimis densius pellucido-hexagono-areolatis, duplicatura ½ producta, lamina dorsali ad basin desinente, costa cum apice dissoluta; capsula terminali ovali-oblonga seu oblongo-obovata; operculo capsulam excedente; calyptra dimidiata operculum vix tegente. — Wet places on the ground in dense wooods. — Fronds 1 – 2 lines high and nearly as wide. Leaves bright green, crisped when dry, short below, rapidly increasing in length as they ascend. Pedicels 4 – 5 lines high.

19. F. SPHAGNIFOLIUS (*sp. nov.*): dioicus pusillus; fronde declinata; foliis flaccidis 5 – 9-jugis confertis flabellatim expansis longe lineari-lanceolatis integerrimis hic illic submarginatis, cellulis amplissimis subrhombeis flexuose circumscriptis utriculo primordiali valde evoluto, duplicatura inæquali vix ½ producta, costa longe infra apicem dissoluta; capsula terminali in pedicello geniculato-ascendente inæquali-oblonga incurva; operculo longe rostrato calyptram lineari-conicam excedente. — Found growing with No. 17. — Fronds similar in size and outline to those of No 18; pedicels longer.

20. F. CLAVIPES (*sp. nov.*): dioicus perpusillus simplex vel parce ramosus laxifolius; foliis 8 – 10-jugis lineari-lanceolatis ubique densius pellucide rotundato-areolatis basi duplicaturæ ½ productæ laxius oblongo-

areolata excepta, lamina dorsali ad basin sensim evanescente, marginibus omnibus limbo angusto integro e cellulis linearibus constructo circumcinctis, costa cum apice evanida; capsula terminali ovali-oblonga, pedicello apice incrassato; operculo longirostrato; calyptra dimidiata. — Wet banks of rivulets. — A very small species, remarkable for the apophysate appearance of its capsule, owing to a thickening of the upper part of the pedicel. Stems 2 – 3 lines high, with bright-green foliage, crisped when dry.

21. F. PETROPHILUS (*sp. nov.*): monoicus rigidus gracilis, basi nudiuscula fasciculatus, prolifero-elongatus; foliis circiter 30-jugis confertissimis erectis longissimis angustis e basi ad apicem sensim acuminatis, duplicatura inæquali ¾ et ultra producta, lamina dorsali angusta supra basin sensim evanescente, cellulis firmis pellucidis flavidis subrotundis illis secus costam sub apice evanidam majoribus; capsula terminali inæquali-oblonga subinclinata brevipedicellata; operculo et calyptra precedentis. — On rocks in ravines. — Fronds 8 – 10 lines high, slender, gradually increasing in width towards the top, where they are nearly one line wide. Foliage of a firm texture, dark green dashed with light brown, not crisped when dry.

Gen. TREMATODON, *Rich.*

22. T. LONGICOLLIS, *Rich.; Schwægr. Suppl. t.* 126. — On banks, rare.

Gen. TRICHOSTOMUM, *Hedw.*

23. T. CANALICULATUM, *Hampe.* — Same as a Venezuelan specimen from Hampe: where described? — On the rocky banks of streams.

24. T. MACROSTEGIUM (*sp. nov.*): dioicum gregarium; caule simplici brevi gracili; foliis e basi pellucide ampliuscule areolata longa vaginante superne latiore undulata erecto-patentibus ovato-acuminatis vel lanceolatis, perichætialibus longioribus margine flexuoso-involutis, omnibus superne dense quadrato-areolatis apice plus minus serratis, costa percurrente; capsula anguste cylindracea curvula inclinata; operculo longissime aciculari capsulam superante; perist. dentibus longis leniter contortis atropurpureis papillosis filiscenti-attenuatis. — On rocky banks. — The distinguishing characters of this species are, the sheathing base of its leaves, particularly the perichætial, the remarkably long operculum, exceeding in length the slender, cylindrical, inclined, and often horizontal capsule, and the finely attenuated apices of the teeth of the peristome.

25. T. INVOLUTUM (*sp. nov.*) : dioicum dense cæspitans caule subsimplici densifolioso; foliis lineari-lanceolatis e basi brevi erecta horizontali-recurvis involuto-concavis marginibus angustissime inflexis, costa cum apice evanida; capsula cylindracea in pedicello breviusculo erecta; operculo conico-rostrato; perist. dentibus brevissimis erectis plus minus irregularibus bifidis vel pertusis. — On rocky ground. — Stems thick, 3 - 4 lines high; pedicels about the same height; foliage very dark green. The main characters of this species are, the imperfect peristome, and the strong involution of the leaf, which, when flattened, is of a broad elongato-lanceolate outline.

26. T. INVOLUTUM, var. statura minore, foliis fusco-flavescentibus minus divergentibus. — In similar localities.

Gen. BARBULA, *Hedw.*

27. B. GRACILIS, *Schwægr.; Bryol. Europ. t.* 145. — On wet, rocky banks.

28. B. AGRARIA, *Swartz; Doz. et Molkb. Prod. Bryol. Surinam. p.* 15, *t.* 8. — Rocks, and dry, sandy places; common.

29. B. LINEARIS, *Swartz; Schwægr. Suppl. t.* 30. — Moist, rocky ledges.

30. B. CRUGERI, *Sond.; Mull. Synop.* 1, *p.* 618. — Banks of earth in coffee-fields.

31. B. OBSCURA (*sp. nov.*): dioica; cæspite arctius cohærente; caule gracili fastigiato-ramoso laxifolioso; foliis recurvo-patentibus e basi oblonga sensim longe lineari-acuminatis ad apicem costatis subtortilibus; capsula elongato-cylindracea curvula; operculo conico-subulato. — Dry banks. — Near *B. gracilis*, but has less crowded and more spreading leaves, not tapering so suddenly from the base, nor reflexed on the margins. The capsule is longer and slightly curved.

32. B. SUBULIFOLIA (*sp. nov.*): dioica laxe cæspitans; caulibus gracilibus erectis dichotome ramosis; foliis laxis erecto-patentibus strictis e basi ovato-lanceolata sensim in subulam longam costa valida fere impletam productis; capsula cylindracea erecta; operculo aciculari. — Wet rocks, along mountain rivulets. — Resembles *B. campylocarpa, Tayl.*, but has a straight and shorter capsule, and leaves with a more predominant costa.

33. B. MNIIFOLIA (*sp. nov.*): dioica laxe cæspitosa; caule humili; foliis laxis mollibus patulis pellucidis e basi oblonga carinato-concava

lingulato-spathulatis inferne oblongo-, superne hexagono-, amplissime areolatis anguste marginatis, costa apicem vix attingente; capsula cylindracea erecta; operculo conico-lineari obtuso. — Dry, shaded banks. — Stems 3 – 4 lines, pedicels 7 – 8 lines high. The foliage much resembles that of *Mnium punctatum.*

Gen. DICRANUM, *Hedw.*

34. D. DEBILE, *Hook. et Wils.; Sulliv. Icon. Musc. ined. t.* 20. — Ground, wet places.

35. D. ALBULUM (*sp. nov.*): dioicum albido-viride tenerum laxe cæspitans flexuoso-erectum; ramis incurvis; foliis pellucidis confertis homomallis subfalcatis anguste longe lanceolato-subulatis convolutis, margine lineari-areolato ad basin lato apicem versus angustiore vel evanescente circumductis, cellulis superioribus quadratis, inferioribus lineari-oblongis, alaribus ventricosis aureo-fuscis, costa debili percurrente apice dentata; capsula elongato-cylindracea erecta; operculo conico-aciculari. — On decayed logs. — A pale-green species, resembling small forms of *D. congestum.* Teeth of peristome light brown at base, yellow above; spores large. Belongs to the section *Leucoloma* of *Dicranum* (*Mull. Synop. Musc.*).

Gen. ANGSTRŒMIA, *Br. et Sch.*

36. A. GUILLEMINIANA, *Mont. Syll. Cryptog. p.* 44. — Banks, on mountain-sides.

37. A. VARIA, var. Hedw.; *Bryol. Europ. t.* 57, 58. — Road-sides.

Gen. CAMPYLOPUS, *Brid.*

38. C. GIGANTEUS (*sp. nov.*): procerus robustus luteo-viridis nitidus fusco-tomentosus parce ramosus; foliis in sicco vel humido reflexo-patulis longissime lanceolato-subulatis supra medium argute serratis minute quadrato-areolatis, cellulis alaribus permultis amplis fuscis, costa percurrente dorso maxime lamellosa; capsula in pedicello brevi cygneo-demissa ovato-gibbosa sulcata strumulosa; calyptra dimidiata basi albo-fimbriata; operculo longe rostrato. — Grows in wide, dense masses, on the summit of high mountains. A very large species, with stems 3 – 5 inches high, and leaves three fourths of an inch long.

39. C. CUBENSIS (*sp. nov.*): robustiusculus lutescenti-viridis nitidus purpureó-tomentosus innovando-ramosus subinterrupte foliosus; foliis longissimis siccis vel humidis reflexo-patentibus angustissime lanceo-

lato-subulatis superne argute serratis minute quadrato-areolatis, cellulis alaribus amplis ventricosis fusco-purpureis, costa dorso versus apicem lamellosa, lamellis serratis; capsula gibboso-ovali in pedicello sicco erecta, humido decurvo-cygneo demissa; operculo aciculari; calyptra dimidiata basi fimbriata. — Grows in dense tufts on the ground. — Not unlike large forms of *C. flexuosus*, but the margins of its leaf and the lamellæ on the back of the costa are serrulate.

40. C. TENUISSIMUS (*sp. nov.*): laxe cæspitans parce purpureo-tomentosus; caule tenuissimo flexuoso-erecto 4–5-ies innovando-continuo, innovationibus inferne appresso-foliosis veluti nudis; foliis comalibus paucis subverticillatis horizontalibus longissime setaceis apice dentatis, angulis baseos maxime dilatatis e cellulis magnis ventricosis purpureis constructis, areolatione alibi minuta subquadrata viridescente; archegoniis normalibus; capsula desiderata. — On decayed logs in dense forests. — A very slender species 1–2 inches long, remarkable for the subverticillate comal leaves on the successive innovations, which give the plant somewhat the aspect of a minute *Chara* or *Galium*.

Gen. HOLOMITRIUM, *Brid.*

41. H. CRISPULUM, *Mont.; Schwægr. Suppl. t.* 309. — Logs and bushes in thick woods.

42. H. WRIGHTII (*sp. nov.*): dioicum? robustum innovando-ramosum; foliis confertis horizontali-recurvis elongato- vel lineari-oblongis latiusculis acuminatis canaliculato-concavis vel subcomplicatis apice grosse irregulariter dentatis, cellulis oblongis apicem versus ellipticis chlorophyllosis, costa percurrente, perichætialibus longissime vaginantibus subito longe subulatis; capsula elongato-ovato-cylindracea; operculo e basi conica subulirostro; calyptra lineari dimidiata. — On trees in dense woods. — A dark-green species resembling *H. crispulum*, *Hornsch.*, which, however, has cauline leaves suddenly acuminate from a broad obovate base: in the present species the leaves are of a uniform width throughout, except at the point.

Gen. LEUCOBRYUM, *Hampe.*

43. L. TENUIFOLIUM (*sp. nov.*), *L. subulato* (*Hampe*) simillimum sed foliis latioribus brevioribus inferne multo angustius marginatis differt. — On decayed logs in thick woods. — Specimens without capsules.

44. L. ROBUSTUM (*sp. nov.*): a *L. longifolio*, cui proximum, statura

majore, foliis confertioribus secundis subfalcatis longioribus margine apicisque dorso integerrimis (nec scabris) distat. — Logs and roots of trees, in dense woods.

Gen. CALYMPERES, *Swartz.*

45. C. TENUIFOLIUM (*sp. nov.*): subacaule comoso-foliosum; foliis longissime setaceis siccis vel humidis strictis apice breviter acuminatis dentatis, habitu *C. Mulleri* (*Dz. & Mb.*) et *lonchophylli* (*Schw.*), qui distant hic foliis brevioribus siccis confertissimis, illic tamen affinior, foliis flavidis apice repando-truncatis edentatis. — Decayed wood. — Specimens without fruit.

Gen. SYRRHOPODON, *Schw.*

46. S. PROLIFER, *Schw. Suppl. t.* 180: var. foliis longioribus angustioribus siccis non tortuosis, humidis margine non flexuosis: forsan species propria. — Decayed wood.

47. S. GAUDICHAUDI, *Mont. Ann. Sc. Nat.* (1834), *p.* 376, *t.* 16. — Grows in large dense mats on logs in thick woods.

48. S. HOBSONI, *Grev. in Ann. Lyc. Nat. Hist. New York*, 1. *p.* 271, *t.* 23. — Trunks of trees in forests.

49. S. ELONGATUS (*sp. nov.*): cæspite valde compacta magna profunda; caulibus subsimplicibus erectis strictis longissimis; foliis e basi hyalina vaginante plus minus ciliato-dentata subito squarroso-reflexis subpendulisve lineari-lanceolatis acuminatis carinato-subcomplicatis anguste pellucido-limbatis, e cellulis minutis subquadratis opacis areolatis, apice spinuloso-dentato radiculas ramosas atropurpureas copiose emittentibus, costa percurrente: fl. et fr. desideratis. — Decayed logs and stumps. — Grows in deep close turfs, pale green above, reddish brown below. Stems 3 – 5 inches high, closely matted together throughout their entire length by masses of dark purple radicles growing from the points of their leaves, and forming a conspicuous feature.

Gen. MACROMITRIUM, *Brid.*

50. M. MUCRONIFOLIUM, *Schw. Suppl. t.* 170. — On trees.

51. M. CIRRHOSUM, *Brid.; Schwægr. Suppl. t.* 201. — Branches of trees on high mountains.

Gen. SCHLOTHEIMIA, *Brid.*

52. S. TORQUATA, *Brid. Bryol. Univ.* 1, *p.* 333; *Hedw. Sp. Musc. t.* 63. — Same locality as the last.

Gen. LEPTOTHECA, *Schwægr.*

53. L. Wrightii (*sp. nov.*): pseudo-monoica robusta densissime cæspitosa; caule subsimplici apice congesto-folioso; foliis obovatis spathulato-obovatisque tenuiter marginatis laxe mnioideo-areolatis, costa excurrente breviter cuspidatis, perichætialibus minoribus; capsula erecta gracili longe cylindracea annulata; perist. ext. dentibus longissimis linearibus valde papillosis, int. ciliis rudimentariis; operculo conico breviuscule rostrato; calyptra dimidiata subulata. — Decayed logs in dense woods. — A large species growing in compact dark-green turfs. Stems ½ – 1 inch high, matted together by reddish-brown tomentose radicles. Leaves crisped when dry, small and scattered on the lower part of the stem, rapidly increasing in size and crowded above. Pedicels ¾ – 1 inch high. Capsule light olive-green when ripe, the rim of the mouth coral-red. Annulus large, compound. Operculum whitish. Teeth of the peristome slender, remotely articulated, yellowish white above, reddish below, strongly papillose throughout. Minute male plants, evidently from the germination of spores, occur on various parts of the fertile plants. According to description, *L. speciosa*, H. & W., from the mountains of Jamaica, appears to be near our plant, but that species has ovate-lanceolate leaves.

Gen. DISSODON, *Grev. & Arn.*

54. D. ? rotundifolius, *C. Mull. Synop.* 1, *p.* 140; *Hook. Musc. Exot. t.* 76. — Moist rocks in ravines.

Gen. OCTOBLEPHARUM, *Hedw.*

55. O. albidum, *Hedw. Musc. Frond.* 3, *p.* 15, *t.* 16. — Decayed logs, etc.

Gen. BARTRAMIA, *Hedw.*

56. B. tenella, *C. Mull. Synop.* 1, *p.* 481. — Shady banks, on mountain-sides.

Gen. POGONATUM, *Beauv.*

57. P. Cubense (*sp. nov.*): *P. Liebmanniano* manifeste proximum, distinctum tamen statura graciliore, foliis oblongis brevius acuminatis laxioribus latioribus et brevioribus, capsula papillosa, etc. — On dry banks.

Gen. RHIZOGONIUM, *Brid.*

58. R. SPINIFORME, *Bruch.; Hedw. Musc. Frond.* 3, *t.* 25. — Ground, near the roots of trees; common.

Gen. BRYUM, *Dill.*

59. B. ARGENTEUM, *L.; Bryol. Europ. t.* 384; *var. lanatum.* — On the ground; common.

60. B. CORONATUM, *Schwægr. Suppl. t.* 71. — Old logs in fields.

61. B. CÆSPITICIUM, *L.; Bryol. Europ. t.* 374. — On the ground.

62. B. LEPTOCLADON (*sp. nov.*): dioicum tenellum laxe cæspitosum flavescenti-viride; caulibus brevissimis prostratis, innovationibus permultis erectis julaceis tenuissimis remotifoliis; foliis appressis oblongis breviter acutatis cymbiformi-concavis e cellulis amplissimis pellucidis inferne oblongis superne elongato-rhomboideis areolatis, unica serie cellularum indistincte marginatis, costa cum apice evanida; capsula oblongo-pyriformi leniter inclinata late annulata; perist. int. ciliis lanceolato-linearibus vix pertusis, ciliolis nullis; operculo hemisphærico-apiculato. — Moist places on the ground. — A very small species, forming loose yellowish-green patches, well marked by its numerous thread-like innovations, ¾ lines high, and about 1/7 of a line wide. Leaves with a large areolation in proportion to their size. Pedicels 5 – 6 lines high. This species belongs to Muller's section *Areodictyon* of *Bryum.*

63. B. OVALIFOLIUM (*sp. nov.*): dioicum cæspitans; foliis laxiusculis ovali-oblongis obtusiusculis modice cochleariformi-concavis, marginibus planis erectis, apice subincurva lenissime serrulatis, areolatione laxa, costa vix excurrente; capsula oblongo- vel clavato-pyriformi pendula. — Banks of rivulets. — A medium-sized species, distinguished from its allies by its oblong-oval, borderless leaves, with erect margins.

Gen. MNIUM, *Linn.*

64. M. WRIGHTII (*sp. nov.*): dioicum cæspitosum; caule arcuato-ascendente simplici complanato-folioso; foliis dimorphis lateralibus ovali-obovatis apiculatis dorsalibus accessoriisve multo minoribus anguste lanceolatis biseriatis, omnibus dissitis incrassato-marginatis ultra medium costatis laxe rhomboideo-areolatis, apice serrulatis; capsula in pedicello erecto pendula pyriformi; operculo depresso-convexo: flore masculo terminali disciformi, perigonialibus lineari-lanceolatis. — Shady

banks of mountain rivulets. — This remarkable moss, in its dimorphous leaves and their arrangement, may be looked upon as the acrocarpous analogue of *Rhacopilum*, as *Calomnion* is of *Hypopterygium*. About the size of *Mnium cuspidatum*. Leaves thin, rather firm, at first pale green, when old vinous red, the margins and costa deeper-colored. Pedicels ¾ – 1 inch long, occasionally two from the same perichæth.

Gen. CLASMATODON, *H. & W.*

65. C. PARVULUS, *Hampe; Sulliv. Mosses of U. States, p.* 60, *& Icones Musc. ined. t.* 79. — On roots and trunks of trees. The specimens vary from those of the Southern United States in a fuller development of the teeth of the peristome, and in the occasional presence of a few scattered hairs on the matured calyptra.

Gen. FABRONIA, *Raddi.*

66. F. CUBENSIS (*sp. nov.*): monoica, statura *F. pusillæ;* foliis ovato-lanceolatis integerrimis ultra medium costatis, cellulis ovali-rhomboideis laxiusculis chlorophyllosis, alaribus subquadratis granulosis; capsula oblonga subapophysata; perist. ext. dentibus sedecem per paria approximatis fuscidulis longiusculis, int. ciliis octo æquilongis filiformibus; operculo conico acuto. — On trees. — Remarkable for its double peristome, the inner of 8 cilia.

Gen. CRYPHÆA, *Mohr.*

67. C. FILIFORMIS, *Swartz.; Hedw. Musc. Frond.* 3, *t.* 16. — On coffee-bushes. The excurrent portion of the costa of the perichætial leaves is scabrous.

68. C.? LEPTOCLADA (*sp. nov.*): majuscula rigida; caule primario repente aphyllo, secundario pendulo subdendroideo-ramoso, ramis hic illic ramulos singulos fasciculatosve minutissimos appresso-foliosos proferentibus; foliis patentibus e basi subauriculata ovato- vel oblongo-acuminatis concavis margine erectis superne leniter serrulatis, cellulis alaribus permultis quadratis mediis lineari-fusiformibus prosenchymatosis apicalibus elongato-ellipticis, costa debili subpercurrente; capsula desiderata. — Bushes in ravines. — Grows in rather large masses. Secondary stems about 2 inches long, 1½ – 2 lines wide: foliage pale green and yellowish. A noticeable feature is the lateral fascicles of very minute straight shoots from the upper part of the branches: these shoots with their distant closely appressed ecostate lanceolate leaves are about 2 lines long and $\frac{1}{30}$ of a line wide, nearly concealed by the principal leaves.

Gen. ANOMODON, *H. & T.*

69. A. ATTENUATUS, *Hedw.; Bryol. Europ. t.* 475. — Rocks in ravines.

Gen. LESKEA, *Hedw.*

70. L. CAPILLARIS, *Hedw. Musc. Frond.* 4, *p.* 25, *t.* 10. — On trees.

Gen. CYLINDROTHECIUM, *Schimp.*

71. C. MACROPODIUM, *Hedw. Musc. Frond.* 3, *p.* 55, *t.* 23. — Rocks, mountain-sides.

72. C. AMPLIRETE (*sp. nov.*): robustum pallide virens nitidum latè cæspitosum appressum dichotome divisum; ramis latis complanatis obtusis; foliis oblongis apice plus minus obtusis ibidemque grossius serratis, cellulis amplis; capsula deficiente. — Rocky ledges in woods. — The characters above given appear to distinguish this species from any of its known congeners.

Gen. HELICOPHYLLUM, *Brid.*

73. H. TORQUATUM, *Brid.; Hook. Musc. Exot. t.* 41. — On decayed wood.

Gen. RHACOPILUM, *Beauv.*

74. R. TOMENTOSUM, *Brid.; Hedw. Musc. Frond.* 4, *t.* 19. — On logs in woods.

Gen. PILOTRICHUM, *Beauv.*

75. P. UNDULATUM, *Beauv.; Hedw. Musc. Frond.* 3, *p.* 51, *t.* 21. — Trunks of trees.

76. P. FILICINUM, *Beauv.; Hedw. l. c. t.* 18. — Rocks in dense woods.

77. P. CYMBIFOLIUM, *Sulliv. Mosses U. States, p.* 81, *& Icon. Musc. ined. t.* 76.

78. P. LOPHOPHYLLUM (*sp. nov.*): dioicum ? pusillum; caule primario repente, secundario erecto vix unciali inferne simplici reflexo-folioso superne pinnatim et bipinnatim dendroideo-ramoso; ramis ramulisque rigidis tenuissimis brevibus; foliis trifariis erecto-patentibus ovatis breviter acuminatis concavis subserrulatis sparsim papillosis pellucidis, cellulis oblongis ab invicem discretis, costis binis infra apicem abruptis dorso late cristatis; capsula ovali-oblonga ramigena brevipedicellata annulata; perist. ext. dent. lanceolato-subulatis, ciliis linearibus brevioribus; calyptra mitriformi sparsim erecto-pilosa operculum

conico-subulatum solum tegente; perichætialibus apertis elongato-lanceolatis breviter bicostatis. — Trees and decayed logs. — A small pale-green species scarcely 1 inch high, of a dendroid habit, with branches and branchlets very slender, about $\frac{1}{6}$ of a line wide. Near *P. compositum;* but that species, if the figure and descriptions of it are reliable, is a much larger plant, with different habit and leaves.

Gen. METEORIUM, *Dz. & Mb.*

79. M. MACRANTHUM, *D. & M. Pugil. Fl. Bryol. Venez. p.* 47, *t.* 12. — Trees and bushes.

80. M. PATULUM, *D. & M. op. cit. p.* 21, *t.* 10. — On trees.

81. M. CRINITUM, *Sulliv. in U. S. Expl. Exped. p.* 22, *t.* 20. — On bushes in dense thickets.

82. M. TRICHOPHORUM, *Mont. Ann. d. Sci. Nat.* (1843), *p.* 236. — On trees.

83. M. aff. nigricanti? — Without fruit; probably a new species: materials too imperfect to furnish a specific character.

84. M. ILLECEBRUM, *C. Mull. Synop. Musc.* 2, *p.* 137. — On high mountains.

Gen. HOOKERIA, *Smith.*

85. H. CUBENSIS (*sp. nov.*): dioica? dense cæspitans flavo-viridis; caule prostrata, ramis ascendentibus subsimplicibus compressis latis; foliis oblongis subobovato-oblongisve breviter acuminulatis pellucidis ampliuscule elliptico-areolatis immarginatis superne serratis, costis binis tenuibus ad medium evanidis; capsula in pedicello brevi superne scabro oblongo-elliptica erecta exannulata; perist. dent. longissimis angustissimis late marginatis linea mediali angusta notatis, ciliis æquilongis, membrana basilari vix ulla; operculo e basi elongato-conica subulato; calyptra mitriformi pilis latis sursum curvatis adspersa basi 8-10 fida. — On bushes in thick woods. — The erect capsule, pilose calyptra, and pedicel scabrous only on its upper half, sufficiently distinguish this species.

86. H. CYMBIFOLIA, *Hampe in Linnæa,* 1855, *p.* 783. — Logs in dense woods.

87. H. ADNATA, *H. & W. in Fl. N. Zeal. p.* 123, *t.* 93, *f.* 4. — Var. foliis oblongioribus minus acuminatis densius areolatis. — On the bark of trees.

88. H. VARIANS (*sp. nov.*): polygama dense cæspitosa flavicans; caulibus ramisque complanatis; foliis ovato-acuminatis et lanceolatis

flaccidis hyalinis amplissime rotundato-oblongoque-areolatis vix serrulatis limbo angusto e cellularum serie unica circumductis, ad medium tenuiter bicostatis; capsula elongato-oblonga horizontali; operculo conico subulato; calyptra mitriformi glabra, basi multifida; perist. *H. læte-virentis.* — Logs in dense woods. — Near *H. Olfersiana* and *H. albicans*, but the first species has entire leaves, an obovate capsule, and a calyptra scabrous at its apex; in the second, the leaf is oblong, shortly acuminate, and strongly dentate at apex. Specimens under this number (88) have synoicous and monoicous inflorescence.

89. H. VARIANS, var. infloresc. monoica colore glauco-viridi. — On decayed logs in forests.

90. H. VARIANS, var. infloresc. monoica foliis oblongioribus altius bicostatis. — Banks, mountain-sides.

91. H. INCURVA, *Hook. & Grev.; Schwægr. Suppl. t.* 275. — Logs in dense palm-woods.

92. H. MERKELII, *Hornsch. Fl. Bras.* 1, *p.* 62, *t.* 3. — Same locality as the last.

93. H. PAPILLATA, *Mont. Ann. d. Sci. Nat.* 1845, 4, *p.* 93. — Decayed logs in woods.

Gen. HYPNUM, *Linn.*

94. H. EXILISSIMUM (*sp. nov.*): monoicum minutissimum viride nitidum cæspitulosum; caule arcte repente; ramis capillaribus erectis simplicibus ramulosisque; foliis erecto-patentibus anguste oblongolanceolatis sensim acuminatis serrulatis mediotinus costatis, laxe areolatis, cellulis lineari-oblongis pellucidis alaribus numerosis quadratis concoloribus; capsula oblonga subæquali parum inclinata macrostoma; peristomio eciliolato; sporis majusculis; operculo oblique aciculari-rostrato. — On the bark of trees. — *H. acanthophyllum*, Mont., from the description (*Mull.* 2, *p.* 398) appears to be very near this moss, but differs in its horizontal capsule and carinate leaves destitute of special alar cells.

95. H. MINUTULUM, *Hedw.; Bryol. Europ. t.* 481. — Decayed logs and stumps in woods.

96. H. SCHISTOCALYX, *C. Mull. Synop.* 2, *p.* 691? — Locality same as the last.

97. H. TAMARISCINUM, *Dill.; Bryol. Europ. t.* 482 and 483. — Decayed logs.

98. H. INVOLVENS, *Hedw. Musc. Frond.* 4, *t.* 11. — Same as the last.

99. H. MICROPHYLLUM, *Sw.; Hedw. Spec. Musc. t.* 69. — Ground and stones in fields.

100. H. APICULATUM, *Hornsch. Fl. Bras. p.* 87. — Logs on margins of rivulets.

101. H. CUPRESSOIDES, *C. Mull. Synop.* 2, *p.* 303. — Fallen trees in forests.

102. H. INSULARUM (*sp. nov.*): monoicum *H. cupressiformi* simillimum majusculum; ramis latiuscule complanatis; foliis falcato-secundis longe subulatis vix serrulatis, cellulis alaribus utrinque ternis magnis oblongis aureis vesiculæformibus, perichætialibus erectis; capsula in pedicello tenui longissimo parva gibboso-ovali; operculo longe aciculari-rostrato. — Decayed logs. — The broad flat, shining branches, the long slender pedicel, the small capsule, the long rostrate operculum, and the large ventricose alar cells of the leaf, are the distinguishing marks of this species.

103. H. SERRULATUM, *Hedw. Sp. Musc. p.* 238, *t.* 60. — On the ground among decayed leaves.

104. H. PUNGENS, *Hedw.; D. & M. Prod. Fl. Bryol. Surinam. p.* 35, *t.* 19. — Trees and bushes.

105. H. WRIGHTII, *Sulliv. Mosses of U. States, p.* 65, *& Icon. Musc. t.* 127 *ined.* — Roots of trees, etc.

106. H. LOXENSE, *Hook.; Schwægr. Suppl. t.* 259. — Bushes in ravines.

107. H. TENERUM, *Sw.; Mull. Synop. Musc.* 2, *p.* 397. — On the ground and decayed wood, common.

108. H. ACESTROSTEGUM (*sp. nov.*): monoicum exiguum prostratum intertextum luteolo-viride nitidum; caule ramis ramulisque numerosis compressis inordinate subpinnatimve dispositis instructa; foliis confertis e basi constricta oblongo-ellipticis cymbiformi-concavis in pilum longum denticulatum productis ecostatis pellucidis minute lineari-areolatis, cellulis alaribus magnis ventricosis aureis; capsula in pedicello lævi oblongo-ovali exannulata cernua vel pendula; perist. dent. linea lata notatis, ciliolis singulis; operculo longissime aciculari; calyptra angusta dimidiata. — On the bark of trees. — The leaf in shape and structure resembles that of *H. Schwaneckianum* (*C. Mull. in Bot. Zeit.* 1858, p. 172), which however is a larger species with different ramification and inflorescence.

109. H. PLANUM, *Brid.; Schwægr. Suppl. t.* 280. — Logs and stumps.

110. H. PLANUM, var. flavescens; *Mull. Synop.* 2, *p.* 261. — Decayed wood.

111. H. BEYRICHII, *Hornsch. in Fl. Bras.* 1, *p.* 81, *t.* 4, *f.* 1. — Logs in dense woods.

112. H. FLEXUOSUM (*sp. nov.*): dioicum; caule arcte repente pinnato; foliis flaccidis pellucidis albido-viridibus confertis leniter incurvis subdecurvisque lanceolatis in acumen longum loriforme flexuosum grosse dentatum productis laxissime ample elongato-areolatis ecostatis; capsula in pedicello longiusculo apice clavato-incrassato cylindracea horizontali curvula annulata: operculo conico-rostrato. — On dead wood. — Resembles Schwægrichen's figure (*Suppl. t.* 200) of *H. leptocarpon*, but that appears to be a larger species with monoicous inflorescence, and leaves with large ventricose alar cells.

113. H. FLEXUOSUM; planta mascula. — With the last.

114. H. LEUCOSTEGUM, *C. Mull. Synop.* 2, *p.* 344. — Logs in dense woods.

115. H. CALLIDUM, *Mont. in Ann. Sci. Nat.* 1845, 4, *p.* 90. — On trees.

116. H. SENTOSUM (*sp. nov.*): *H. papilloso* simillimum, diversum tamen caulibus prostratis subpinnatis, foliis apice tenuiore grosse dentato papillisque longioribus instructis, pedicello toto lævi, perist. dentibus linea lata pellucida notatis, etc. — On branches of trees.

117. H. SCHWANECKIANUM, *C. Mull. in Bot. Zeit.* 158, *p.* 172. — On trees.

118. H. DEMISSUM, *Wils.; Bryol. Europ. t.* 507. — Moist rocks, mountain-sides.

119. H. REPTANS, *Schw.; Hedw. Sp. Musc. t.* 68. — Logs in shady woods.

120. H. MONTAGNEI, *Schimp. in Mont. Crypt. Cub. p.* 530, *t.* 20. — On decayed logs in forests. — A widely distributed species, found in Manilla, Java, Loo Choo, Hong Kong, Nepal, West Indian Islands, Venezuela, Brazil, Peru, Tahiti, and Sandwich Islands. Subject to considerable variation in its size, and also in the length of the point of the leaf; in other respects quite uniform. Authentic specimens of *H. Montagnei*, Schimp.; *Meyenianum*, Hampe; *Surinamense*, *D. & M.; apertum*, Sulliv.; *succosum*, Mitten, show that they all belong to the same species; and to this list of synonymes it is highly probable the following should also be added: *H. rutilans*, Brid.; *Pœppigianum*, Hampe; *vesiculare*, Schwægr.; *subdenticulatum* and *conostegum*, Mull.

121. H. ADMISTUM (*sp. nov.*) : *H. microcarpo* (*Mull.*) simillimum sed differt capsula inæquali obovata leniter incurva cernua, etc. — On the bark of trees. — Scarcely distinguishable from *Leskea adnata*, Michx. (= *H. microcarpum*, Mull.), founded on Southern United States specimens, except by the capsule, which in that species is always oblong, erect, and equal-sided. It is probable the moss under notice is the same as the St. Croix specimens, referred to Michaux's species by Schwægrichen (*Suppl. t.* 84), and from which Figs. 1 and 2 of that plate were taken.

122. H. DISSOLUTUM (*sp. nov.*) : monoicum *H. admisto* simile, diversum tamen statura majore, cæspite laxe cohærente, ramis eradiculosis longioribus robustis rectis obtusis, foliis latioribus vix secundis, capsula majore oblongo-incurva cernua, etc. — On dead wood.

123. H. DISSOLUTUM, var. statura robustiore. — Same locality.

124. H. THELISTEGUM, *C. Mull. Synop.* 2, *p.* 269. — Rocks in shaded ravines.

125. H. THELISTEGUM, var. major. — Similar localities.

126. H. CULTELLIFORME (*sp. nov.*): monoicum prostratum complanatum parce ramosum sericeo-viride; foliis laxe bifariis asymetrice ovato-oblongis obtuse acuminatis lateralibus sæpe subaciniformibus ad medium costatis serrulatis, cellulis exilissimis lineari-flexuosis alaribus quadratis; capsula oblongo-ovali horizontali; operculo conico longius rostrato. — Flat rocks in shaded ravines. — Resembles in general aspect and manner of growth *H. deplanatum*, Schimp., but that species is somewhat larger, with a dioicous inflorescence.

127. H. CÆSPITOSUM, *Swartz?* — On decayed wood, very common. — This species agrees well with the description by Müller (*Synop.* 2, *p.* 330) of the moss above named, but can hardly be the one figured by Hedwig (*Sp. Musc. t.* 49) as Swartz's species. Hedwig's figure, according to Wilson (*Fl. N. Zeal. p.* 113), does not agree with specimens in *Herb. Hook.* named *H. cæspitosum* by Swartz himself. The specimens here under notice accord exactly with South American ones from Hampe marked *H. Gallipense*, C. Mull., which in the synopsis l. c. is reduced to *H. cæspitosum*, Swartz.

128. H. LÆTUM, *Brid.; Sulliv. Icon. Musc. t.* 115, *ined.;* non *Bryol. Europ.* — Rocks, mountain rivulets.

129. H. RIPARIUM, *Linn.; Bryol. Europ. t.* 570. — Wet places.

Gen. HYPOPTERYGIUM, *Brid.*

130. H. Brasiliense, *Sulliv. in Bot. U. S. Expl. Exped. p.* 26, *t.* 26. — Rocks, in dense woods.

Gen. PHYLLOGONIUM, *Brid.*

131. P. fulgens, *Hedw. Musc. Frond. t.* 39. — Trunks of trees.

In this interesting collection are to be found eight or ten other species, several of them doubtless new, but the specimens are too imperfect for satisfactory identification or description.

Mr. F. H. Storer made the following remarks, in behalf of Mr. John M. Ordway and himself, upon

The Frozen Well at Brandon, Vermont.

Respecting the geological situation and general character of this remarkable well, which has been fully and accurately described by others,* we have nothing new to offer; but we desire to call the attention of the Academy to an important phenomenon that appears to have escaped the notice of previous observers. On visiting the locality in the early part of the present summer, we ascertained the existence of a variable but well-marked current of cold air continually flowing upwards out of the mouth of the well.

When we first visited the spot, in the morning of the 8th of June, the external air being somewhat cool, the ascending current was not noticed; but returning at two o'clock in the afternoon for a more thorough examination, the atmosphere having in the mean time become uncomfortably warm, we at once became sensible of a rush of cold air on bending over the well-curb to look down. This current was still more distinctly felt by placing the hand down near the mouth of the well. Bits of any light material dropped in were buoyed up and forcibly blown out. The mature pappus of the dandelion, which was then in full puff all around, afforded an abundance of very sensitive current indicators. Rolls of paper, slightly damp, being burned just within the mouth of the well, furnished volumes of smoke, which were rapidly expelled, and not only confirmed the existence of a current, but enabled us in some measure to trace the deviations in its course. At three o'clock, the ascent of a column of cold air was still further proved, by holding a thermometer in the opening of the well, the bulb being at the level of the ground, at a point where surely mere radiation from the ice, some thirty feet below, should be fully counterbalanced by the heat radiated to the mercury from the curb and windlass that had been all day exposed to the hot sun. The thermometer there indicated 43°.5 F., the temperature of the external air being 78°. About five feet below the mouth, the thermometer stood at 43°, and twelve feet down, at 40°. Water drawn up from the bottom — without stopping to cool the bucket — was at 34°. Water drawn up at other times contained lumps of ice detached from the coating of ice lining the well to the height of some five feet above the surface of the water. When a candle was lowered down, this ice appeared to be worn away on the northwest side, as though small rills of warmer water were coming in from that direction.

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* See Proceedings of the Academy for 1859, IV. 269. Proc. Boston Soc. Nat. History (1859 - 61), VII. 71, 74, 81. Wells's Annual Sci. Disc., 1860, p. 316; compare Ibid. 1856, p. 190.

We visited the well at different times during the two following days, and found the current as decided as when first perceived. In the cool of the morning it expelled the dandelion pappus as readily as at any other time, though then, from the want of contrast with external heat, it was less felt by the hand or face. Calling the attention of the owner and one of his neighbors to the sensible upward flow of air, we were told by both, that "cold air blows out" of the well constantly, and has always done so. A remark expressed in such terms was somewhat surprising, since the proprietor had assured us on our first visit that no current existed in the well, as had been repeatedly proved by lowering down a candle, which burned steadily in any part. We finally repeated the candle experiment, and found, as might have been expected from the gentle upward current filling the whole circumference of the well, that the flame was not positively deflected, except just below the edge of the opening in the marble slab capping the wall. This hole, being of less diameter than the well itself, compels the air, rising at the sides, to sweep towards the centre, and accordingly, at all points within reach of the influence of this centripetal contraction in the column, the flame of the candle was turned inwards. This blowing of the candle towards the middle from all parts of the circumference of the orifice, is worthy of remark, as showing — what, indeed, the appearance of the ground outside would indicate — that the dirt is so compacted around the marble slab, that the motions of the external atmosphere can do nothing towards producing the current. It shows, too, that at the only place where an *upward* flow could affect a candle, there the deflected flame renders the rush of air apparent. We dwell more particularly on this point, because Messrs. Jackson and Blake, in their communication to the Academy,* have denied the existence of any current in the well, since the flame of their candle was not observed to deviate from its natural course; and because, from the confusion of ideas exhibited by those residing at the locality, it would seem as though there had been entertained a vague notion that a draught or current ought necessarily to be horizontal. In reality, the direct upward course is what would naturally result from the combination of numerous opposing rills of air, coming in from all sides through the loose gravel and cracks in the frozen deposit, and, while seeking the point of least resistance, gradually curving towards the perpendicular direction, even before reaching the stones of the lining wall. If there are, indeed, any single streams of more than the average force, they might be found by running an impervious vertical partition down the middle of the shaft, and then making a smoke close to the joints of the stones in the wall. But the fact that the owner of the ground has only this well to supply water for the daily use of his family, precludes the carrying out of such experiments.

We had hardly begun to make close observations, before it occurred to us that we were dealing with a case of compressed air, which might be accumulated by some natural subterranean *water-trumpet* (*Wassertrommel*), or "Catalan blower," and which, expanding as it approached the surface of the earth or escaped into this artificial outlet, would absorb and render latent a large amount of heat, and could thus effect the gradual refrigeration and actual freezing of a considerable body of wet gravel.† The flow of air — which would otherwise be so diffused as to have no appreciable force at any part of the surface of the drift bed — should become especially apparent in this vent bored down through the overlying clay and fine soil into the very coarse and uncommonly pervious gravel. That the gas expelled differs little, if any, from atmospheric air, is shown by the free burning of the candle, as well as by the lack of any impression produced on the senses, except that arising from mere coldness.

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* Proceedings, IV. 270.

† For a valuable series of experiments made by Dr. John Gorrie, on the absorption of heat by condensed air in the act of expanding, — with particular reference to the economical production of ice, — see Am. Journ. Sci. for 1850, [2.] X. 39, 214; Ann. Sci. Disc., 1851, p. 57.

Considering that the drift heap in which the well is situated rests evidently on limestone, and is not far distant from the junction of the limestone with the mica slate, or gneiss, we may easily conceive of the occurrence of such caverns, fissures, natural conduits, and subterranean water-courses as might complete an arrangement on the principle of the water-trumpet, — one of the oldest contrivances for securing a blast to be used in iron-furnaces, — and thus afford a constant and ever-renewed supply of condensed air. And, as the experiments of Dr. Gorrie show that but a moderate degree of condensation is necessary to enable air to become freezing cold by its return to the normal bulk, we may be warranted in saying that such a cause, though of moderate power and having various impediments to overcome, would be sufficient to produce all the effects observed in the case under consideration. Of course, the colder the air at first, and the colder the compressing and cooling water, the greater would be the refrigeration resulting from the subsequent expansion. And the actual freezing must proceed with greater rapidity at that time of the year when the accumulated heat of the soil is allowed the freest radiation, together with the least chance of increase. In fact, it is said to be a matter of yearly observation, that the well "begins to feel the cold weather," and to freeze over in autumn long before there are any heavy frosts above, and, indeed, while the ground is still open for tillage. This, certainly, would seem to indicate a cause continually operating with almost uniform force.

Since our return from Brandon, we find that the senior editor of the American Journal of Science,* in commenting on an account of the frozen well at Owego,† makes the simple remark, that the phenomenon might possibly be occasioned by the escape of compressed air; but how the air could be condensed, and how or why the effect should follow from such a cause, he does not point out. It does not, therefore, appear whether or not Prof. Silliman had in his mind a theory similar to ours. Excepting this indefinite suggestion, we have met with no hypothesis capable of explaining all the facts in the case.

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* Am. Journ. Sci., 1839, [1.] XXXVI. 185.

† The Brandon well was not in existence at that time.

The supposition that the current observed might come from air of ordinary tension, cooled and stored in ice-caverns during the winter months, and afterwards expelled by water filling up these reservoirs, fails to meet the case. For if there were any accumulation of cold air made during one winter sufficient to hold over till the next, we might expect a gradual diminution of effect from spring till the middle of the following winter, instead of an increase on the first approach of cold weather in autumn. The same objection applies with equal force to the conjecture that winds penetrate the earth through some distant lower inlet, and in winter refrigerate the mass of gravel to an extraordinary degree. And it may be further said respecting the latter idea, that in summer cold air could not rise through a great body of gravel and flow out into the warmer and lighter superincumbent atmosphere, without some powerful *vis a tergo* to enable it to overcome inertia, friction, and gravity, — a force which, being then entirely unaided by any forward draught, must be far greater than could be supplied by any ordinary winds, even under the most favorable circumstances. But even if we suppose winds could blow through ice-caves underground, and permeate the earth above, we still have the ice-caves themselves to account for, as well as the constant renewal of the ice.

But not intending to lay too much stress on the water-trumpet hypothesis, which, of course, is not entirely free from drawbacks, and may or may not be the true explanation of the singular phenomena under discussion, we wish more particularly to bring forward to the notice of the Academy the fact of the continual rush of cold air out of the well at Brandon, — a current probably having some connection with the freezing below. And we may be allowed to remark that, in the case of this particular well at least, any theory which fails to assign a sufficient cause for the continued efflux leaves out of account a matter hardly less wonderful than the perennial congelation itself.

An incidental point worthy of attention is the asserted uniformity in the depth of the water — or ice and water — at all times of the year. Had there been an engineer's level at hand, enabling us to ascertain the relation of the surface of the water in the well to the level of brooks and low grounds not far distant, we might have gathered some positive data having a bearing on the subject. But it would be useless to reason on uncontrolled estimates; and, without dwelling on some other facts not sufficiently studied, we will simply put on record the temperatures of other sources of water opened in and near this limited drift bed. 1st. In a spring sunk to about the depth of ten feet from the surface, — a stone's throw northwest of the frozen well, at the side of the lane leading out of the main road, — the water at top stood at 54° F., and that near the bottom, at 50°. 2d. A similar spring about twelve feet deep, three or four rods west of No. 1, showed a temperature of 50° in water drawn from the bottom. Both these small wells are evidently fed by surface water, and, at the time of our visit, they were filled nearly up to the level of the ground. 3d. In a shallow spring at some distance southwest of the frozen well, in lower ground, and apparently near the limit of the drift, the water stood at 48° F. A deep well in the mica slate formation, about half a mile west, stood at 45° F.

It is to be hoped that the well, and the bed of frozen gravel in which it is situated, may be made the subject of careful experimental investigation. It would, of course, be interesting to ascertain the precise limits and conditions of variation in the current of air. It is also desirable that the *contour* of the drift heap and the grounds adjoining should be accurately determined.

Four hundred and ninety-eighth meeting.

September 10, 1861. — MONTHLY MEETING.

The PRESIDENT in the chair.

The Corresponding Secretary read letters relative to the exchanges of the Academy.

Professor Horsford illustrated the several methods recently suggested and employed for rendering linen and cotton fabrics uninflammable.

Professor Peirce made a communication upon the discrepancy between the observed and the calculated acceleration of the moon's motion, and the question whether it may be due to the influence of meteoric bodies about the earth.

Mr. Swett exhibited a piece of leather, in the form of a breastplate, prepared so as to be impenetrable by the thrust of a bayonet, and explained the method of preparation.